Bacterial Wilt of Potato in Chile

LUIGI CIAMPI-PANNO, Associate Professor, Instituto de Microbiologia and Instituto de Producción y Sanidad Vegetal, Universidad Austral de Chile, Casilla 567, Valdivia

ABSTRACT

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Potato tubers (*Solanum tuberosum*) stored in the Metropolitan Region (Santiago) showed a vascular rot during the 1983–1984 crop season. Isolations and biochemical and pathogenicity tests performed with 15 isolates indicated the presence of race 3 of *Pseudomonas solanacearum*. This is the first report of race 3 in Chile.

Bacterial wilt induced by *Pseudomonas solanacearum* is one of the most important bacterial diseases of potato. It can be found in most producing countries (9,12). The pathogen is spread mainly through infected seed. In potato tubers, the disease may not be seen before harvest, but it is seen later during storage, when the pathogen destroys the vascular tissues. In potato plants growing in the field, a severe wilt of one and, later, all the stems is a field expression of bacterial wilt (9,12).

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Previous studies of bacterial pathogens affecting potatoes in Chile showed the presence of *Erwinia caratovora* pv. *caratovora* and *E. caratovora* pv. *atroseptica*, as well as pectinolytic soft-rotting strains of *Bacillus* and *Pseudomonas* and saprophytic coryneform bacteria (2–4). These studies did not detect pathogenic strains of *Corynebacterium sepedonicum* and *P. solanacearum*, however.

The objectives of this study were to determine the etiological agent involved in a vascular rot detected in samples of potato tubers (*Solanum tuberosum*) stored in the Metropolitan Region (Santiago).

MATERIALS AND METHODS

The two samples of six tubers each used in this study were part of a sample obtained on two farms where potato tubers were kept under storage during the 1982–1983 crop season. Both locations are in the Metropolitan Region (Santiago) in central Chile. Procedures and culture media for isolation were as described by Kelman (10) and Hayward (7). Tests for biochemical characteristics of the bacterial isolates were conducted as described by Hayward (6).

Isolations were performed from diseased tubers, wilted plants grown from diseased tubers, and inoculated tobacco and potato plants. From all these sources, colonies were observed on tryphenyltetrazolium agar (TZC) (10).

Pathogenicity tests were conducted using two methods. The first one included use of naturally diseased potato tubers as seed tubers in three pots growing under greenhouse conditions. The second method was conducted on two tobacco (*Nicotiana tabacum* L.) and two potato plants (*Solanum tuberosum* L.) cv. Desirée) grown under greenhouse conditions. Tobacco and potato were stem-inoculated with a pure culture of bacteria (1,5). Sterile nutrient agar blanks were used for both tobacco and potato plants.

RESULTS AND DISCUSSION

Field symptoms of sampled potato tubers. All potato tubers assayed for the presence of bacterial pathogens showed

internal necrosis along the vascular system. A light yellow vascular discoloration was evident in every cut of fresh material. A milky exudate was apparent when cut pieces of potato tubers were placed in water. From a couple of tubers with advanced symptoms, yellow-cream-colored ooze was squeezed. A few cavities were observed.

Pathogenicity test. Potato halves from diseased tubers in pots grown under greenhouse conditions developed 10-cm-high plants with strong wilt symptoms. There was no evidence of soft rot or a brown vascular discoloration of the stems. No bacterial ooze was present after pressing the stem. Inoculated tobacco plants developed wilt symptoms after 6 days at 28 C. The two plants used to test pathogenicity of the isolates were completely wilted after 25 days at 28 ± 2 C. The same results were observed with potato plants, which developed wilt symptoms within 12 days.

Isolation and identification of the pathogen. Pure cultures obtained from all the plant materials revealed the presence of gram-negative, nonmotile, straight rods. Endospores were absent. Other characteristics of the isolates were fast growth with no pigment production on common media and fluid growth with red pigmentation on TZC agar. Acid was produced on lactose, maltose, and cellobiose but not on dulcitol, mannitol, or sorbitol.

Symptoms observed in cut tubers corresponded to a typical bacterial necrosis of the vascular ring. These symptoms were similar to vascular necrosis symptoms of bacterial wilt described by several authors (8,9,12).

According to our criteria, the tubers showed what can be designated as early symptoms or light infection, because there was no evidence of dehydration, large cavities, or surface damage of the tubers (12). Tuber infection by a vascular pathogen was evident when wilt symptoms developed on small plants grown from diseased half tubers. The brown color of the vascular bundles indicated the presence of a pathogen, as described in the literature (9,12). The small size of the plants grown from infected tubers in pots indicated tuber infection and the premature loss of the plant prevented such advanced plant symptom expressions as bacterial ooze from the vascular system (12).

Proof of virulence of the isolates was evident when stem-inoculated tobacco and potato plants developed wilt symptoms. A brown vascular discoloration was observed in all the sectioned stems.

Morphological, cultural, and biochemical characteristics of the pure cultures studied, pathogenicity tests conducted, and symptoms observed from stored potato tubers are sufficient proof that the pathogen involved with the internal vascular rot of the six potato tubers studied is *P. solanacearum*. The biochemical characteristics of the isolates studied indicated also that they correspond to biotype II (7,11). This indicates the presence of race 3 isolates in the Metropolitan Region of Central Chile (Santiago).

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